CNTA
Citizens for Nuclear Technology Awareness

Savannah River Site Citizens Advisory Board

Radiation-"What is it, What it isn't"

November 15, 2011

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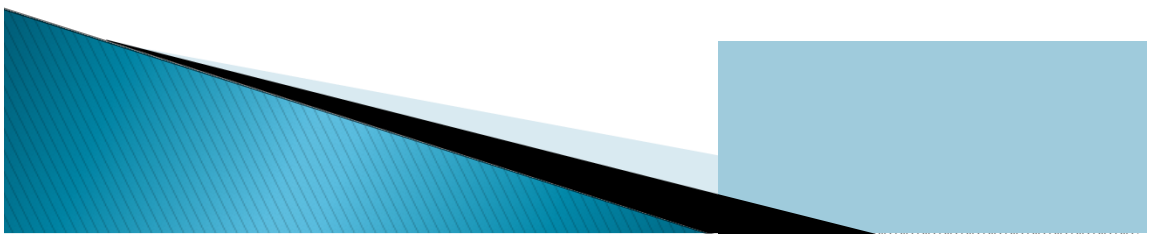
SUPERSTITION

WHEN YOU BELIEVE IN THINGS

THAT YOU DON'T UNDERSTAND,

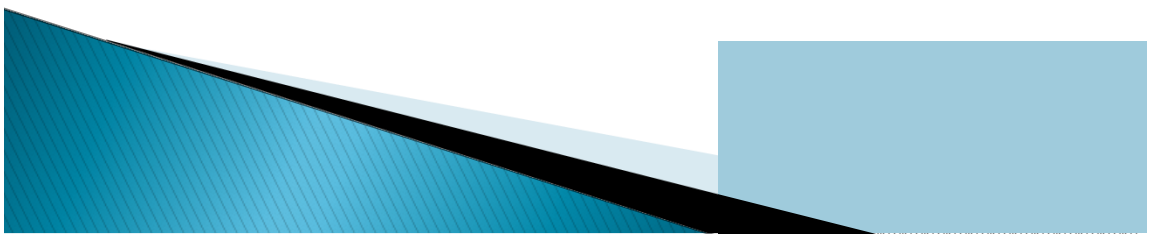
THEN YOU SUFFER….

SUPERSTITION AIN'T THE WAY



ABC's of Radiation

- What is radiation?
- Where does it come from?
- How is it measured?
- What are its uses?
- What are its effects?

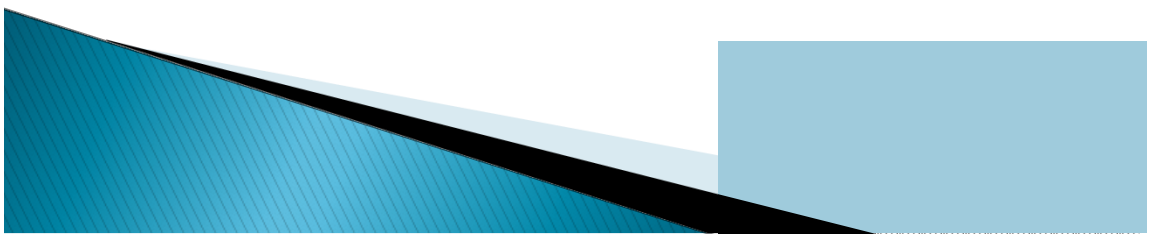


What is Radiation?

- Alpha (two protons and two neutrons)
- Beta (energetic electron)
- Gamma (like very energetic light)
- Neutron (like a proton with no charge)

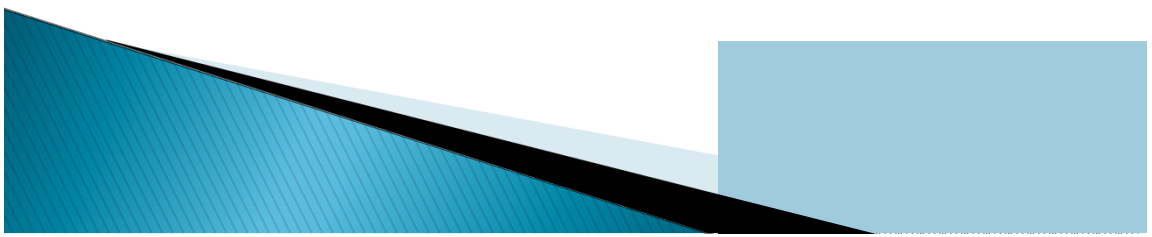
Where Does It Come From?

- Nature
  - From the sun, air ground, water, food that contain radioactive material
- Man-made
  - Radioactive materials made in reactors, etc.
  - Fallout from weapons tests
  - Medical uses
  - Consumer Products



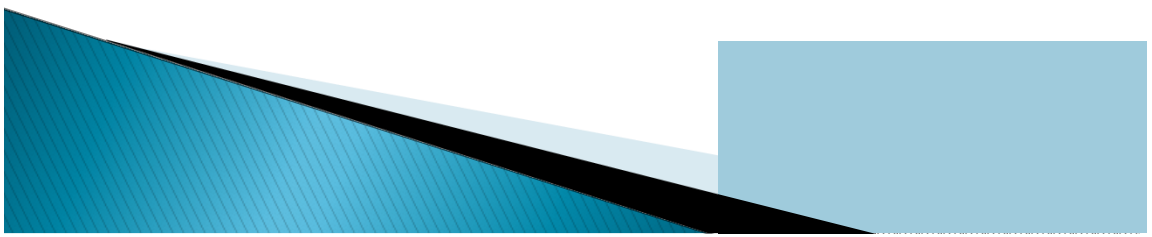
How Is Radiation Measured?

- Can't be seen, smelled, heard
- Sensitive radiation detectors are used to detect radiation
  - It is like lighting a match in Aiken and detecting its light in Augusta
- Radiation dose measured in "rem"



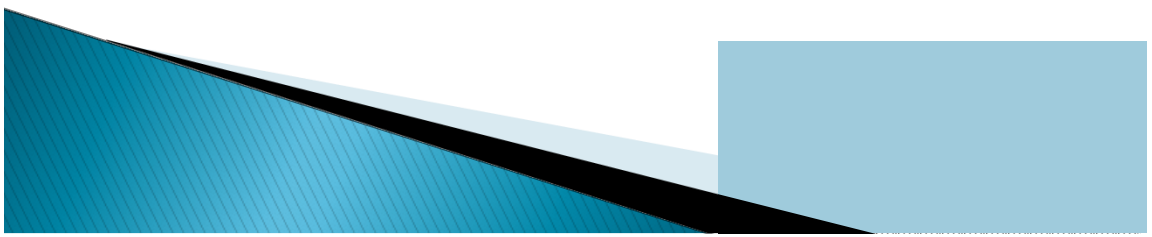
Uses of Radiation

- Nuclear Weapons
- Medical Applications
  - X-rays, other diagnostic uses
  - Cancer Treatment
- Consumer Uses
  - Smoke detectors, exit signs, density gauges, oil exploration, flow measurements, many others



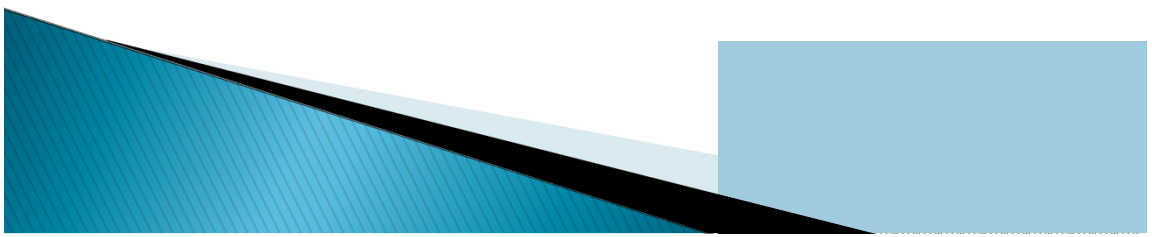
The Radiation Hazard

- Ionizes molecules in cells
  - Can result in breaking molecular bonds
  - Can change cell chemistry
- Cell Death or Damage
  - Alteration of cell type
  - Can lead to latent illness



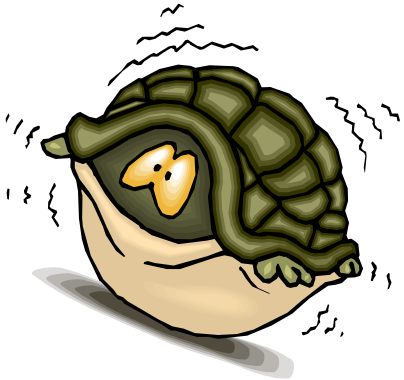
Radiation & Health

- It is probably the most studied hazard
- Work with radiation is highly regulated
  - Very restrictive & numerous requirements
- Numerous national & international advisory organizations on radiation protection
- Why? Because it…



…SCARES People!

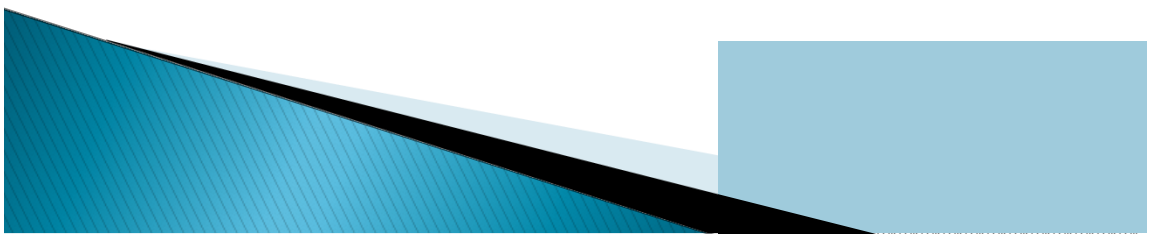
FEAR



We are afraid of the unknown!

Radiation Phobia

- Results in very high costs for nuclear industries
- No new nuclear power plants in the last 30 years (a global warming issue)
- Possibly results in disproportionate attention compared to other areas of national safety
- …But it sells newspapers!



Myth #1 – Americans get most of their yearly radiation dose from nuclear power plants.

- Truth – We are surrounded by naturally occurring radiation. Only 0.005% of the average American's yearly radiation dose comes from nuclear power; 100 times less than we get from coal, 200 times less than a cross-country flight, and about the same as eating 1 banana per year.

Myth #2 – A nuclear reactor can explode like a nuclear bomb.

- Truth – It is impossible for a reactor to explode like a nuclear weapon; these weapons contain very special materials in very particular configurations, neither of which are present in a nuclear reactor.

Myth #3-Nuclear energy is bad for the environment.

- Truth-Nuclear reactors emit no greenhouse gasses during operation. Over their full lifetimes, they result in comparable emissions to renewable forms of energy such as wind and solar. Nuclear energy requires less land use than most other forms of energy.

Myth #4 – Nuclear energy is not safe.

- Truth – Nuclear energy is as safe or safer than any other form of energy available. No member of the public has ever been injured or killed in the entire 50-year history of commercial nuclear power in the U.S. In fact, recent studies have shown that it is safer to work in a nuclear power plant than an office.

Myth #5- There is no solution for huge amounts of nuclear waste being generated.

- Truth – All of the used nuclear fuel generated in every nuclear plant in the past 50 years would fill a football field to a depth of less than 10 yards, and 96% of this “waste” can be recycled. Used fuel is currently being safely stored. The U. S. National Academy of Sciences and the equivalent scientific advisory panels in every major country support geological disposal of such wastes as the preferred safe method for their ultimate disposal.

Myth #6 – Most Americans don't support nuclear power

- Truth – In surveys conducted in 2009, it was found that 70% of Americans support nuclear power. Further, 84% of Americans see nuclear energy as an important source of electricity for the future, and 70% would accept a new reactor at the nearest nuclear power plant site.

Myth #7 – An American "Chernobyl" would kill thousands of people

- Truth – A Chernobyl-type accident could not have happened outside of the Soviet Union because this type of reactor was never built or operated here. The known fatalities during the Chernobyl accident were mostly emergency first responders. Of the people known to have received a high radiation does, the increase in cancer incidence is too small to measure due to other causes of cancer such as air pollution and tobacco use.

Myth #8 – Nuclear waste cannot be safely transported

- Truth – Used fuel is being safely shipped by truck, rail, and cargo ship today. To date, thousands of shipments have been transported with no leaks or cracks of the specially-designed casks.

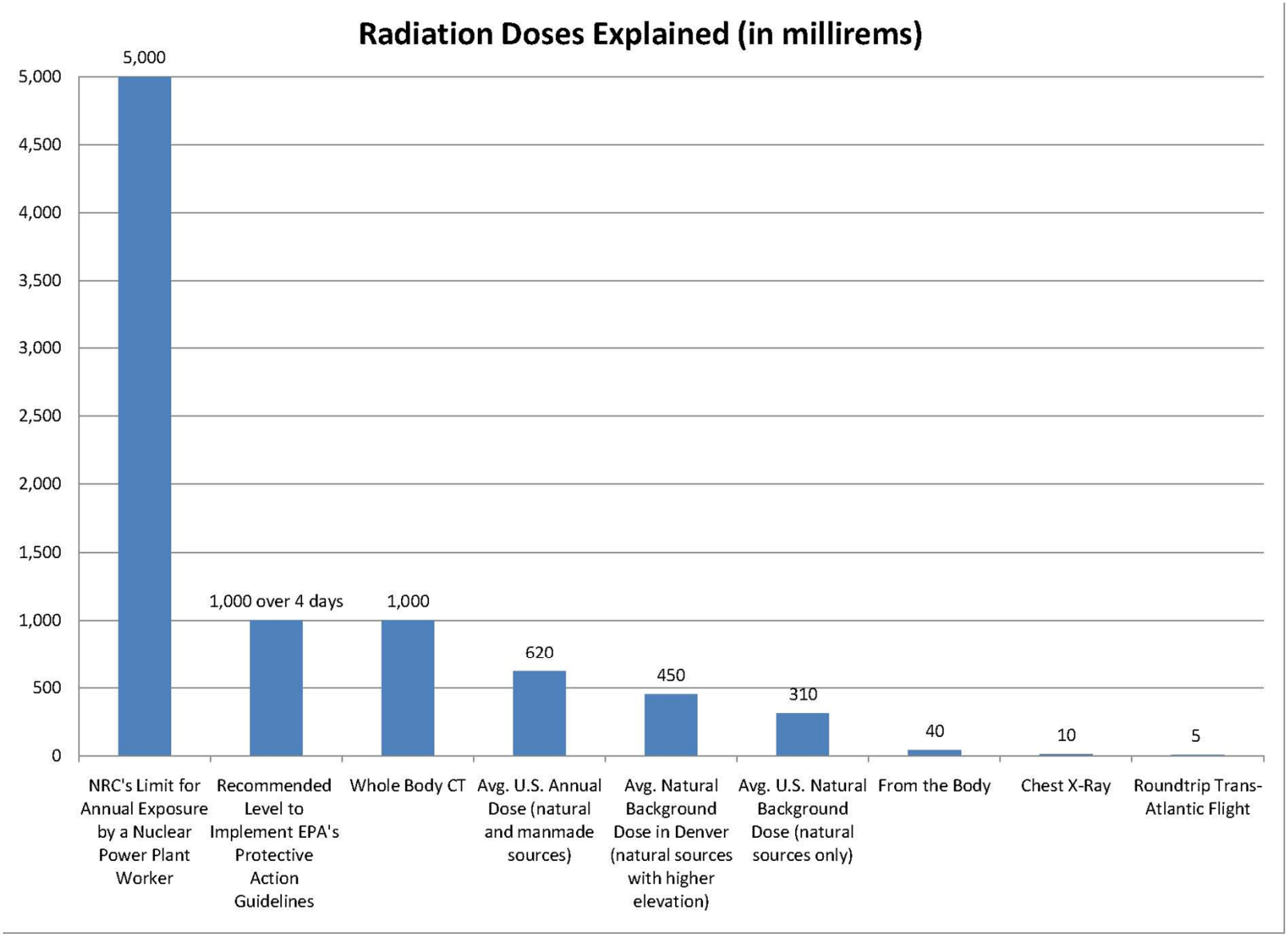
Myth #9 – Used nuclear fuel is deadly for 10,000 years

- Truth – Used nuclear fuel can be recycled to make new fuel and byproducts. Most of the waste from this process will require a storage time of less than 300 years. Finally, less than 1% is radioactive for 10,000 years. This portion is not much more radioactive than some things found in nature, and can easily be shielded to protect humans and wildlife.

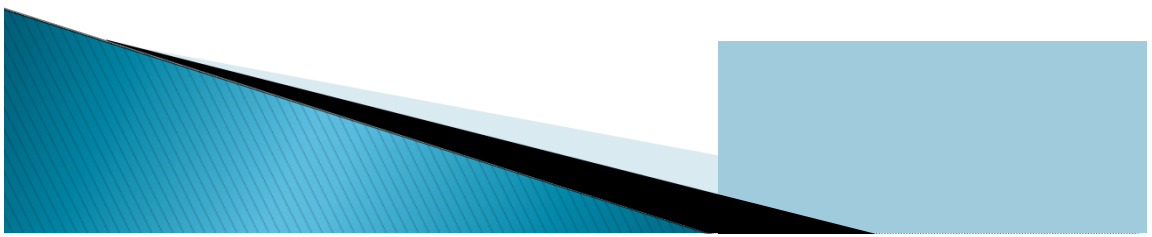
Myth #10 – Nuclear energy can't reduce our dependence on foreign oil

- Truth – Nuclear-generated electricity powers electric trains and subway cars as well as autos today. It has also been used in propelling ships for more than 50 years. That use can be increased since it has been restricted by unofficial policy to military vessels and ice breakers. In the near-term, nuclear power can provide electricity for expanded mass-transit and plug-in hybrid cars.

- Small modular reactors can provide power to islands like Hawaii, Puerto Rico, Nantucket and Guam that currently run their electrical grids on imported oil. In the longer-term, nuclear power can directly reduce our dependence on foreign oil by producing hydrogen for use in fuel cells and synthetic liquid fuels.


Radiation Doses Explained (in millirems)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
5,000
1,000 over 4 days
1,000
620
450
310
40
10
5
NRC's Limit for Annual Exposure by a Nuclear Power Plant Worker
Recommended Level to Implement EPA's Protective Action Guidelines
Whole Body CT
Avg. U.S. Annual Dose (natural and manmade sources)
Avg. Natural Background Dose in Denver (natural sources with higher elevation)
Avg. U.S. Natural Background Dose (natural sources only)
From the Body
Chest X-Ray
Roundtrip Trans-Atlantic Flight

Closing Thoughts……



- Radiation is universal. It does not just come from nuclear reactors. The average American absorbs 360 millirems a year (recently revised upward to 620 mrem), while living next to a reactor would only add 1 mrem.

- There is no evidence that radiation exposure at less than 100,000 mrem causes any health effects. All claims to such damage are based on the linear, no-threshold assumption, which has no empirical confirmation.

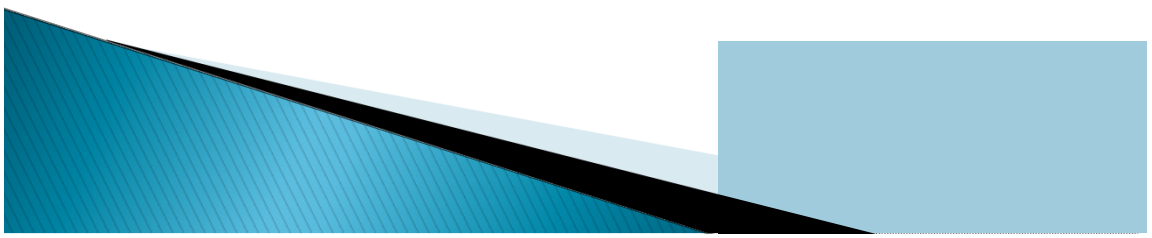
- No one died at Three Mile Island. There has never been any evidence of increased cancer or birth defects in surrounding areas.· - Nuclear reactors are running extremely efficiently and safely. The electricity they provide is cheaper than just about everything else.

- The incredible energy density of nuclear power gives it an infinitesimally small environmental footprint compared to all forms of dilute “renewable” energy.

- About 50 people died at Chernobyl. Background radiation in surrounding areas is now near normal

"Men go mad in herds. They recover their senses only slowly, and one by one."

Quote by Charles McKay, author of *Extraordinary Popular Delusion* and the *Madness of Crowds.*



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